GEOPHYSICAL SURVEYS

ENT 1-16 CLAIMS

YUKON TERRITORY

Latitude: 65° 16' 18" N

Longitude: 138° 43' 11" W

Claim Sheet: 116G/7

JULY 22 - AUGUST 9, 1980

090751

Project #6201

James L. Wright

This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as representation work in the amount of

$ 6,400.00

Resident Geologist or
Resident Mining Engineer

Considered as representation work under Section 53 (4) Yukon Quartz Mining Act.

B. R. BAXTER
Supervising Mining Recorder

for Commissioner of Yukon Territory

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INTRODUCTION

Carbonate hosted barite-lead-zinc deposits such as the Jug Property give, in some cases, fairly distinct geophysical signatures. Gravimetric and Induced Polarization surveys typically yield the most beneficial data. The higher density of barite and increased chargeability of associated galena provide the physical property contrasts necessary for the two respective methods. If the concentration of sulfides is substantial, electromagnetic techniques become feasible, as well, owing to the lower bulk resistivities encountered. Of limited value are the magnetic techniques which generally show little of interest over such deposits. The above four techniques (i.e. Gravimetric, I.P., Electromagnetic, Magnetic) were applied to portions of the Jug Property in an effort to delineate economic quantities of barite-lead-zinc mineralization. This report will put forth the methodologies used, present the data, and discuss the interpreted results. Finally conclusions and recommendations will be drawn.

LOCATION and ACCESS

The Jug Property as reviewed herein comprises of sixteen (16) claims situated approximately 146 km north of Dawson City and 20 km west of Ogilvie which lies on the Dempster Highway. The area lies within the Ogilvie Mountains roughly 3 km south of the Ogilvie River. Mount Bouvette is situated 6 km easterly. Latitude, longitude, and army map coordinates for the property's northern corner are tabulated below.

Latitude: 65° 16' 19" N

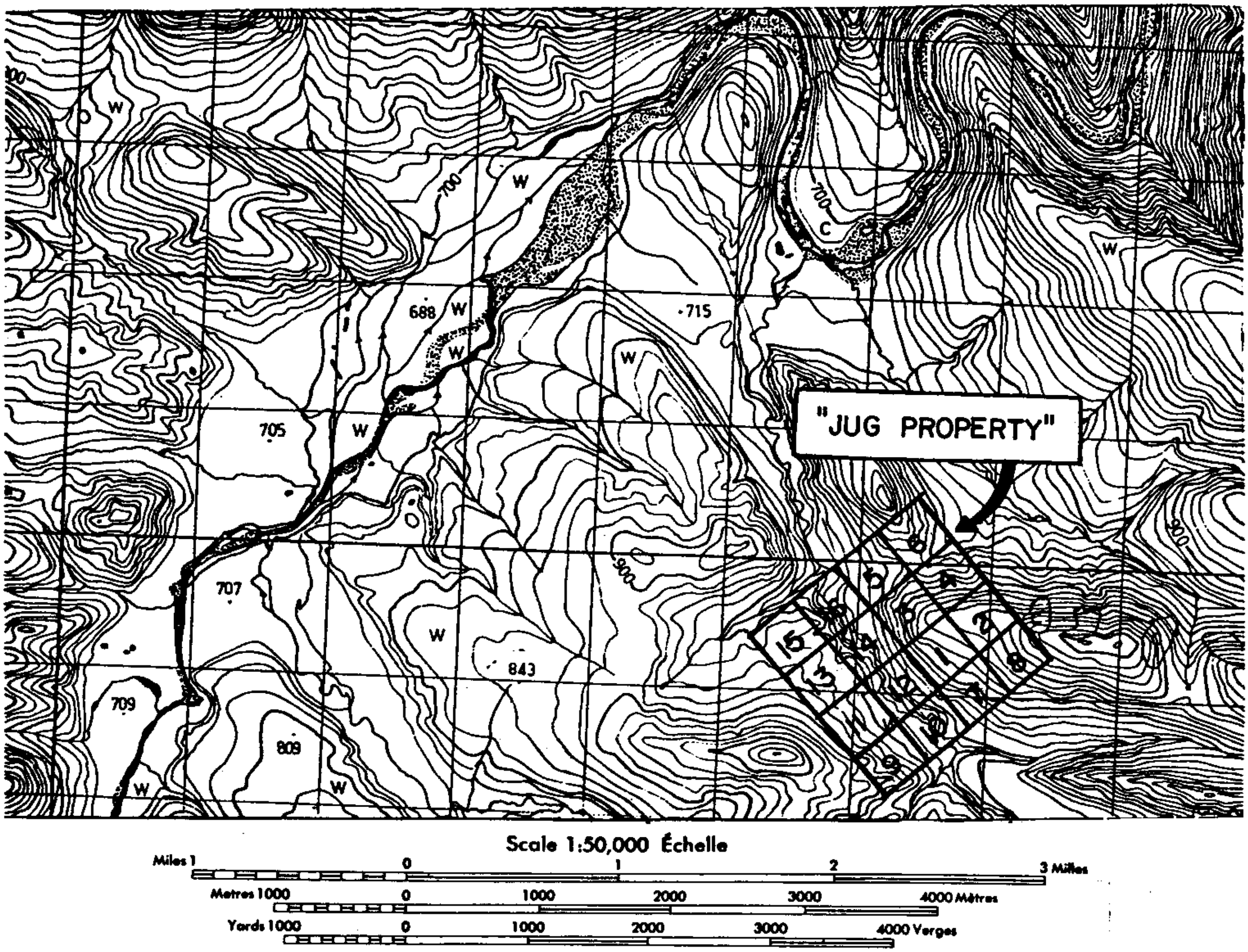
Longitude: 138° 43' 11" W

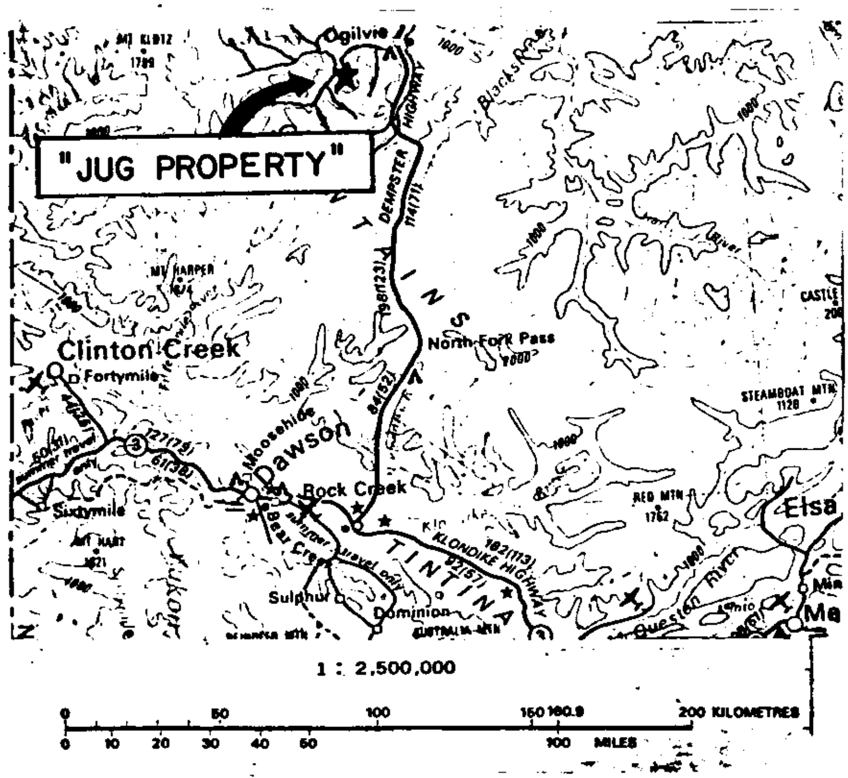
Army Map Coordinates: 064405

The area surrounding the property can be found upon the Mount Bouvette topographic sheet NTS 116G/7, edition 1.

Access is via the all-weather Dempster highway north from Dawson City to the point at which it crosses the Ogilvie River. From here a 20 km helicopter flight westerly brings one to the property.

Further details concerning the location and access can be found upon the following location map.





ST. JOSEPH EXPLORATIONS LIMITED

TORONTO, CANADA

"JUG PROPERTY": YUKON

LOCATION MAP

APPROX. LAT. & LONG. OF LOWER RT. COR. OF DWG. LATITUDE LONGITUDE	PROJECT NO. 6201	SHEET NO. OF
	REPORT NO.	N.T.S. 116 G/7

PROPERTY STATUS

The property consists of sixteen (16) contiguous claims numbered YA 32738 - YA 32753 inclusive and are designated the ENT 1-16 claims. The above claims were recorded at the Dawson Mining Recorder's Office. Preussag Canada Ltd. is the recorded holders with an expiry date of June 22, 1980. An extension was granted pending completion of the work described herein.

GEOLOGIC SUMMARY

The regional stratigraphic section consists of sedimentary formations of Devonian-Mississippian age. Within the area Canol shale is underlain by fossiliferous Middle Devonian limestone of the Cranwick Formation, and overlain by an unnamed Upper Devonian-Missisippian shale and turbidite facies, probably correlative with the Imperial Formation. Structually the area shows large, open, upright east trending synforms and antiforms of Early Tertiary age. Faulting is not particularly important as regards rock deformation.

In the immediate area of the ENT claims a fine-grained cherty dolomite is overlain by black calcareous shale of the Ordovician-Silurian Road River Formation, and underlain by buff coarse-grained sandy dolomite. Near the top of the massive cherty dolomite layer, numerous fractures are filled by coarsely crystalline secondary barite. Galena crystals and mineral Zonation are also noted within the dolomite unit.

Further details concerning the geology of the area can be found in open file report #279 in August, 1974.

PREVIOUS WORK

Undoubtedly many prospectors have traversed the area since the turn of the century. First recorded work appears in 1974 when Dynasty Explorations Ltd. mapped the barite veining and associated sulfide mineralization. Some soil geochemistry was performed and the claims subsequently allowed to lapse. Restaking was performed in 1979 by Archer Cathro and Associates on behalf of St.Joseph Explorations Limited and Preussag Canada Ltd. No work was performed during 1979.

SURVEY PROCEDURE

Each survey will be reviewed separately in the following. In addition, a brief outline of the grid layout is put forth. Address for the four (4) employees involved are as below.

J.L. Wright - 2808 KeeleStreet, Toronto, Ontario.

D.M. Windsor - 90 Eglinton Ave. W., #505, Toronto, Ontario

L. Stoliker - 138 Ball's Lane, Cobourg, Ontario

G. Moum - Toronto, Ontario.

Grid

During July of 1980, St.Joseph Explorations Limited personnel established a grid centered upon the barite showing near the common corner of ENT 11 - ENT 14. A total of 2.8 line-km and a baseline 300m in length were established. Baseline orientation is Az. 340° with a line spacing of 50m and pickets or flagging placed every 25m.

Magnetometer Survey

Logistical details concerning the survey appear below.

Dates:	July 27, 1980
Personnel:	G. Moum
Instrumentation:	Barringer GM-122 Magnetometer Scintrex MBS-2 Base Station
Base Station Location:	Camp (approx. L200S, 100E)
Base Station Value:	58400 gammas
Line Interval:	50m
Station Interval:	12.5m
Production:	2.8 line-km

Details concerning equipment specifications can be found in Appendix A.

Diurnal control was provided by a continuously recording base station which monitored the earth's field each minute to a resolution of $\pm$ 1 gamma. The field data was adjusted by additive constants provided from this strip chart. After diurnal correction, an arbitrary datum of 58000 gammas was subtracted and the results plotted upon a grid map at a scale of 1:1250. No contouring of the data was done due to the extremely low magnetic relief.

Gravity Survey

Logistical details concerning the survey appear below.

Dates:	July 26 - August 7, 1980
Personnel:	D.M.Windsor, L.Stoliker, J.L.Wright
Instrumentation:	Sodin G410 Gravitymeter Sokkisha Level and Rod
Base Station Locations:	L025S, 7E; L150N, O.B.L.; L150S, 25W
Line Interval:	50m
Station Interval:	12.5m
Production:	231 stations

Details concerning equipment specifications can be found in Appendix B.

Values of the vertical acceleration of gravity were read to a resolution of 0.01 mgals with elevations determined to within 0.03m for each station. A standard looping procedure was employed for the levelling with closure errors generally less than 0.06m for a loop 1 km in length. All errors were distributed linearly. Corrections applied to the data included drift, latitude, free air, bouguer, and terrain corrections. Each is reviewed briefly below.

Drift: Three base stations outlined above were reread at least once an hour and errors linearly adjusted. This corrected thermal and tidal drift effects.

Latitude: A standard correction applied using a constant of .00616 mgals/10m north or south.

Free Air: A standard correction applied using a constant of .308462 h where 'h' is the height of the ground plus tripod.

Bouguer: A standard correction applied using a constant of .10478 h where 'h' is the height at ground level. The density used was 2.50 g/cc.

Terrain: A standard correction applied using rings B, C, and D of a regulation graticule.

In addition the meter constant was .10132 mgals/dial reading. Summarized below is a formulation of the above corrections.

Δg = (Dial Reading) (.10132) $\pm$ (Drift Correction) $\pm$ (.00616 mgals/10m north or south) + (.308462 h) - (.10478 h) + (Terrain Correction)

The Δg values thus produced are referred to as the Bouguer Anomaly if the terrain correction is not included or the Complete Bouguer Anomaly with inclusion of the terrain correction.

Plots upon grid maps of both the Bouguer Anomaly and Complete Bouguer Anomaly can be found in the pocket at the rear of the report. Scale is 1:1250 with a contour interval of 0.1 mgals or 1.0 gravity unit.

Horizontal Loop Electromagnetic Survey (H.L.E.M.)

Logistical details concerning the survey appear below:

Dates:	July 27-28, 1980
Personnel:	L. Stoliker, G. Moum
Instrumentation:	Apex Parametrics Max-Min II
Coil Separation:	50m
Frequencies:	888 Hz & 3555 Hz
Station Interval:	12.5m
Line Spacing:	50m
Production:	2.8 line-km

Details concerning equipment specifications can be found in Appendix C.

In-phase and out-of-phase magnitudes of the secondary electromagnetic field expressed as a percentage of the primary field were recorded. A resolution of $\pm$ 0.5% was obtained. Two frequencies were read to enhance conductor discrimination. Profiles of the in-phase and out-of-phase field strengths were plotted upon grid maps for each of the two frequencies. As before the scale is 1:1250 with a profile scale of 1cm = 10%. Further details concerning any plotting conventions can be found upon prints of these maps to be found in the pocket at the rear of the report.

Induced Polarization Survey (I.P.)

Logistical details concerning the survey appear below:

Dates:	July 31 - August 6, 1980
Personnel:	D.M. Windsor, L. Stoliker, G. Moum
Instrumentation:	Rx - Huntec MK-4 Tx - Phoenix IPT-1
Array:	Dipole-Dipole; a = 50m; n = ½, 1-5
Station Interval:	50m
Line Spacing:	50m
Production:	Seven (7) Dipole-Dipole set-ups Centers - L150N, L100N, L50N, L0, L50S, L100S, L150S; O.B.L.

Details concerning equipment specifications can be found in Appendix D.

Chargeabilities expressed in milliseconds and resistivities in units of ohm-m were read. Standard pseudo-section dipole-dipole plots were constructed and can be found in the pocket at the rear of the report. Contour intervals are 10 msec for the chargeabilities and logarithmic for the resistivities.

INTERPRETATION

Each survey method will be discussed separately in the following:

Magnetometer Survey

As expected magnetic relief over the grid is extremely flat showing a total differential of only about 40 gammas. Background is in the 58410 gamma range. No contouring was done due to the flatness of the data. Furthermore no variations exist which would appear to have any bearing as to possible barite-lead-zinc mineralization.

Gravity Survey

The following discussion will deal only with the terrain corrected data or the Complete Bouguer anomaly. Examination of the plot shows a quite striking low running exactly down the stream course. This undoubtedly is reflecting incomplete terrain correction for the deeply incised stream channel. However, more complete terrain corrections would be impractical at this time as a quite thorough topographic survey would be required. Recognition of this effect does allow for rudimentary visual corrections. A prominent shelf in the gravity data traverses the western ends of L100S - L150N at roughly the 125W level. This corresponds closely with the inferred shale-dolomite contact to be reviewed shortly with regards to the I.P. survey. A similar feature is noted on the eastern ends of L0-L150N at the 150E level. However a shale contact is not indicated in this area by the I.P. data. Of possible economic interest is a moderate amplitude anomaly centered near L100S, 37.5E. This extends both northerly and southerly along strike with a maximum response of about 0.30 mgals on lines 100S and 50S. In addition a possible extension westerly across the stream is suggested by relatively elevated gravity values on L100S at the stream crossing. Indeed, a ridge seems to cut the prominent low produced by the topographic effect of the stream. This may connect with a low amplitude response at L50S, 80W. Line 150S seems somewhat confused gravimetrically suggesting faulting may be involved in this area.

The above discussed anomaly is likely reflecting the generally higher bulk densities caused by the observed barite veining. No large tonnage of barite seems to be indicated.

Horizontal Loop Electromagnetic Survey (H.L.E.M.)

Much in-phase noise is noted due to the extreme topography encountered. This is particularly noticeable along the stream course were quite steep cut banks occur. Three anomalous areas are noted and designated anomalies A, B and C. Line locations for each follow.

Anomaly A: L50N, 190W; LO, 180W; L50S, 180W; L100S, 130W(approx.); and L150S, 150W

Anomaly B: L0, 15W

Anomaly C: L150S, 20W

Anomaly A spans several lines and is expressed by much out-of-phase noise. This is a quite poor conductor and likely represents one of three situations: Shear zones, overburden or to the somewhat more conductive shales noted on this portion of the grid.

Anomaly B is somewhat more interesting in that it lies within the dolomitic unit carrying the barite. However, it too is a quite poor conductor and could well be caused by a shear.

Anomaly C is again quite complex reflecting perhaps two parallel zones. It like the other two is a very poor conductor and may likely be related, as with anomaly A, to the more conductive shale unit.

Induced Polarization (I.P.)

Technically the data is quite interesting. All seven (7) sections show the dolomite as a low chargeability region of relatively high resistivity flanked both easterly and westerly by the more chargeable, lower resistivity shale. Bulk resistivities for the dolomite seem to be in the 10000-20000 ohm-m range while the shales show resistivities near 100 ohm-m. These true bulk values are difficult to determine exactly due to overlapping effects. Chargeability backgrounds appear to be roughly 8 msec for the dolomite and, quite variable, but near 40 msec. for the shale. Easterly and westerly shale-dolomite contacts for the seven (7) lines are tabulated below.

	Easterly	Westerly
L150N	250E	100W
L100N	250E	125W
L50N	250E	150W
L0	250E	150W
L50S	275E	150W
L100S	275E	150W
L150S	300E	50E

The dolomitic 'window' seems quite uniform except on L150S where it abruptly pinches down to only 250m in width. However around 125W the shales appear to terminate and a unit having characteristics of the dolomite returns. This may represent some form of faulting or complex folding.

Within the dolomite some faint chargeability anomalies can be located. Generally these only rise to about the 15 msec range or twice background. The anomaly runs down the baseline with exact line locations tabulated below.

L150N, O.B.L.
L100N, O.B.L.
L50N, 25W
LO, O.B.L.
L50S, 0 - 50W

Lines 100S and 150S become confused as the overlying shale progresses easterly and seems to cover the anomaly. This anomalism is fairly weak and probably represents the minor galena mineralization noted in outcrop.

RECOMMENDATIONS and CONCLUSIONS

The results presented above are not particularly encouraging from an economic deposit standpoint. No appreciable volume of barite and/or galena mineralization seems to be situated near surface. This is not to say such a deposit could not lay at depth. Indeed, a depth penetration of only 50m was attained with this programme. However, if drilling were done it is suggested that the collar be located on LO and drilled so as to intersect the I.P. and H.L.E.M. anomalies noted earlier. Of second priority would be a drill hole to test the gravity response centered on L100S, 37.5E. No further geophysical work is suggested at this time.

James L. Wright

JLW*MS

James L. Wright
Geophysicist

APPENDIX A

(ii) Magnetometer Instrument Data

General Description, Principle of Operation

If a proton rich fluid such as Kerosene, jet fuel, heptane, etc. is placed into a magnetic field the protons will align along the magnetic field vector. The magnetic field is induced in the sensor upon depressing the push-button. Then this field is suddenly removed. Protons which behave as elementary gyroscopes will start pre-cessing around the remaining magnetic field that of the earth. The precession frequency is directly proportional to the magnetic field of the earth. The magnetometer counts this frequency, divides it by the appropriate constant to obtain a reading in gammas and displays the reading in the form of a 5 digit number.

GROUND MAGNETOMETER

MODEL GM-122

SPECIFICATIONS

Range:	20,000 to 99,999 in 12 ranges
Accuracy:	± 1 γ through operating temperature range
Sensitivity:	1 γ
Gradient Tolerance:	600 γ/ft.
Power:	12-"D" cells
Power Consumption:	< 50 Joules (Wsec) per reading
Polarizing Power:	0.8 A @ 13.5 V for 1.5 sec. (3 second cycle) 0.8 A @ 13.5 V for 3 sec. (6 second cycle)
Number of Readings with 1 Battery Set:	2,000 - 10,000 depending on type of batteries
Frequency of Readings:	1 every 3 seconds 1 every 6 seconds
Controls:	Pushbutton switch Range Selection switch - Slide switch for 3 and 6 sec. located on P/C Board
Output:	5 digit incandescent filament readout
Indicators:	LED point Lock Indicator - last three digits of the display blanked off when phaselock not achieved Segment Function Indicator - all segments light up to permit visual inspection of the display function

Mechanical:

Instrument: Dimensions - 7" X 3.5" X 11" (18 cm X 9 cm X 28 cm)

Weight - 8 lbs (3.6 kg) including batteries

Sensor: Omnidirectional noise cancelling toroidal sensing head

Dimensions - 4 7/8" (12 cm) diameter
- 4 3/8" (11 cm) height

Weight - 3 lbs (1.4 kg)

Ambient Conditions: Operating Temperature Range - -40°F to 131°F (-40°C to 55°C)

Relative Humidity - 0 to 100%

Environmental: Instrument and sensor case made of high impact plastic

SCINTREX

TOTAL FIELD MAGNETIC BASE STATION

MODEL MBS-2

SPECIFICATIONS:

Resolution	1 gamma
Total Field Accuracy	± 1 gamma over full operating range
Operating Range	20,000 to 100,000 gammas in 25 overlapping switch selectable steps
Gradient Tolerance	Up to 5000 gammas/metre
Sensor	Omnidirectional, shielded, noise-cancelling, dual coil
Sampling Rate	Internal control: switch selectable every 2, 4, 10, 30 seconds or 1,2,10 minutes External control: manual command or by external clock at any rate longer than 2 seconds. For external trigger, a positive transition from 0 to +4V or greater initiates one reading
Clock Accuracy and Stability	± 10 ppm over full temperature range
Visual Outputs	5 digit light emitting diode numerical display lasting 0.1 seconds in automatic recycle mode and 1.7 seconds in manual mode. Internal strip chart recorder with 65 mm chart width and 100 or 600 mm/hr chart speed. Inkless recording. Switch selectable at 10, 100 or 1000 gammas full scale
External Outputs	5 digit, 1-2-4-8 BCD DTL, TTL compatible (2 loads) with 0.5 msec, 5V pulse for synchronization of MBS-2 and external recorder. Analogue recorder output of 1V at 1 mA max. Switch selectable for 10, 100 or 1000 gammas full scale.
Time Marker	A 1.5 second pulse every 10 minutes generates a time mark on the internal or on external analogue recorders. For an external analogue recorder, a switch to ground is provided (NPN transistor, 40V max., 250 mA max). No side pen is required for continuously writing recorders as the pen returns to zero at every event mark. Intervals of less than 10 minutes are optional.

Sensor Cable	50 m length is standard
Power Requirement	The internal batteries of the MP-2, (8 "D" cells) are used to power all functions of the MBS-2. This power source lasts approximately 80 hours, at 25°C and a once per minute sampling interval. An external 10 to 32V DC supply may alternatively be used. Current drain is approximately 0.9A during polarize time and 35 mA during standby, depending upon supply voltage.
Battery Test	Digital readout of normalized internal battery voltage activated by touching switch.
Operating Temperature Range	Console: 0 to 50°C Sensor: -35 to 50°C
Dimensions	Console: 140 mm x 310 mm x 390 mm Sensor: 80 mm diameter x 150 mm length Tripod: 130 mm extended length
Weights	Console: 7.7 kg Sensor with cable: 5.5 kg Tripod: 1.5 kg.
Shipping Weight	Approximately 18 kg
Optional Accessories	Sensor monopod, harness, sensor backpack and 2 m sensor cable allow field portable survey use of MP-2 magnetometer. See MP-2 specification sheet.

APPENDIX B

SPECIFICATIONS

SODIN MODEL 410 GRAVITYMETER

Range (Reset)	3500-6000 mgals*
Fine Counter Range	1000 div. x scale constant **
Fine Counter Constant	0.09-0.11 mgal
Fine Counter Linearity	1 in 1000
Accuracy	0.1 counter div.
Drift	0.05 mgal/day or better
Level Sensitivity	40 sec./mm
Temperature Coefficient	less than 0.003 mgal/hr/°C external change

APPENDIX C

The Maxmin II is a two-man continuously portable EM system. It is designed to measure both the vertical and horizontal in-phase (IP) and quadrature (QP) components of the anomalous field from electrically conductive zones.

The plane of the transmitter (Tx) is kept parallel to the mean slope between the transmitter and receiver (Rx) at all times. The Maxmin II is a horizontal loop (HL) system when the receiver measures anomalous components perpendicular to the mean slope between the coils. It is a minimum coupled (Min C) system when the receiver measures anomalous components parallel to the mean slope between the coils.

APEX MAXMIN II EM SYSTEM SPECIFICATIONS

OPERATING FREQUENCIES:	222, 444, 888, 1777 and 3555Hz.
MODES OF OPERATION:	a) Transmitter coil plane and receiver coil plane horizontal (Max-coupled; Horizontal loop mode). Used with reference cable. b) Transmitter coil plane horizontal and receiver coil plane vertical (Min-coupled mode). Used with reference cable. c) Transmitter coil plane vertical and receiver coil plane horizontal, tilted for null in the receiver output. (Vertical loop mode). Used without reference cable, in parallel lines.
COIL SEPARATIONS: (modes a and b)	25, 50, 100, 150, 200 and 250mm (MM II) or 100, 200, 300, 400, 600 and 800 ft. (MM II F). Coil separations in mode c) not restricted to fixed values.
PARAMETERS MEASURED:	a) In-Phase and Quadrature components of the secondary field in modes a) and b). b) Tilt-angle of the total field in mode c).

2/.....

READOUTS:	a) Automatic, direct readout on 90mm (3½ edgewise meters in modes a) and b). nulling or compensation necessary. b) Tilt-angle and null on 90mm (3½") edgewise meters in mode c).
SCALE RANGES:	In-phase: ± 20% normal, ± 100% by switch Quadrature: ± 20% normal, ± 100% by swit Tilt: ± 75% slope Null: Null sensitivity adjustable by separation switch.
READING REPEATABILITY:	± ½% to ± % normally, depending on conditions, frequency and coil separation used.
TRANSMITTER DIPOLE MOMENT:	150 Atm^2 @ 222Hz, 150 Atm^2 @ 444Hz, 90 At @ 888Hz, 40 Atm^2 @ 1777 Hz and 30 Atm^2 @ 3555 Hz.
RECEIVER BATTERIES:	9V transistor radio type, 4 batteries Life: approx. 35 hrs. continuous duty (alkaline; .5Ah), less in cold weather.
TRANSMITTER BATTERIES:	a) 12V7.5Ah Gel-Cell rechargeable batteries (2 x 6V in series) b) 18V21Ah alkaline lantern batteries (3 x 6V in series). Transmitter current drain 0.5A to 2.2A depending on operating frequency.
REFERENCE CABLE:	Light weight, special teflon cable for minimum friction. Unshielded. All reference cables option at extra cost. Please specify.
	Built-in intercom system for voice communication between receiver and transmitter operators.
INDICATOR LIGHTS:	Built-in signal and reference warning lights to indicate erroneous readings.
OPERATING TEMPERATURE:	$-40^{o}C$ to $+ 60^{o}C$ ($-40^{o}F$ to $+ 140^{o}F$)
WEIGHT OF RECEIVER UNIT:	6kg (13 lbs.)
WEIGHT OF TRANSMITTER UNIT:	Typically 65 kg (143 lbs.), depending on quantities of reference cable and batteri included. Shipped in two shipping/field cases.
VOICE LINK:	Built-in intercom system for voice communication between receiver and transmitter operators.

APPENDIX D

1.2 SPECIFICATIONS

Inputs

Signal Channel

Range	5 x 10^{-5} to 10 volts. Automatic gain ranging Overload indication above 10 volts
Resistance	Greater than 10^{9} Ohms differential
Capacitance	Less than 3 x 10^{-11} Farads
Bias Current	Less than 10^{-8} Amperes
Bandwidth	100 Hz analogue, 12 Hz/digital switch (sub-panel) selectable (see Synchronization under Functional Specifications).
SP Cancellation Range	-5 to +5 volts (automatic)
Protection	Low leakage diode clamps, gas discharge surge arresters, field replaceable fuses.
Terminals	Two colour-coded (red and black) signal inputs, plain chassis ground terminal. Push posts: 120 volt insulation, accepts maximum 1.5 mm diameter wire.

Reference Channel

Maximum	5 volts peak
Overload Indication	Operates above 2.5 volts peak
Resistance	2 x 10^{5} Ohms differential
Capacitance	Less than 3 x 10^{-11} Farads
Input Connector	Four pin female

Battery

10 Nickel-Cadmium "F" cells in series. Nominal 12.5 volts. 8 hours continuous operation in RUN mode. LOW BATTERY indicator operates at nominal 11.5 volts. Automatic shut-down occurs at approximately 10 volts to prevent battery damage and/or bad data. Battery voltage is available on digital display via keypad.

Functional Specifications

Electrical

Memory

Random Access

Memory (RAM)	4k, expandable to 8k
Erasable Programmable Read Only Memory (EPROM)	6k, expandable to 8k

Signal Channel

Automatic Gain Ranging Amplifier	x1 to 4096 in increments of 2^n
Aliasing Filter	100 Hz low pass fourth order MURROMAF polynomial, 24 db/octave roll off
Sample and Hold A/D Converter	12-bit, signal aperture 125 x 10^{-9} seconds conversion rate 16.7 kHz
Sampling Rate	Frequency domain mode 512 Hz Time domain mode 256 Hz
Synchronization	Determined by phase locked loop. Frequency of input signal must be within 0.01% of frequency setting on sub-panel.
Rejection filters	Greater than 40 db at rejection frequency, auto tuned at start of reading.
Self Calibration	Compensates for drift in analogue circuitry and digital filters to improve accuracy of amplitude and phase measurements

Mechanical

M-4 Receiver with Battery Pack	45 cm x 33 cm x 14 cm, 9.1 kg
M-4 Receiver (with battery pack and cassette DataLogger)	Same dimensions, 10.1 kg
Replaceable Battery Pack	3.3 cm x 11 cm x 45 cm, 3 kg

Environmental

Temperature	Operation: -20C to +55C Storage: -40C to +70C
Humidity	Moisture proof, operable in light drizzle. Splash-proof switches, keypad protected by rubber boots, gasket seals on sub-panel cover, main chassis and cassette loader
Altitude	-1525 m to +4775 m
Shock and Vibration	Suitable for transport in bush vehicles

OUTPUTS

Displays and Indicators

Analogue Meter	Ohms scale for source resistance measurements and indication of instrument activity which facilitates qualitative judgments of signal and noise levels
LCD, 3½ digits	Provides the operator with numeric indication of measurement results, and of instrument faults discovered during execution of diagnostic routines. An over-range arrow indicates that the display reading is to be multiplied by 1000.

Flag Indicators

Signal Overload	Blinks red when the peak signal is too large (greater than 10 volts), or when an excessive common mode voltage is present.
REF Overload	Blinks red when the reference input level should be reduced (active only during the reference "ON" time).
Low Battery	Blinks red when the battery voltage falls below 11.5 volts
Power	Steady red indicates power is on.

Cassette Datalogger (Optional)

The accessory cassette DataLogger is accommodated in the M-4 Receiver mainframe and provides two recording modes:

PART (Partial)	whereby all sub-panel settings, calculated quantities and reference numbers are recorded (2 seconds recording cycle);
FULL	whereby all information as in the PART mode is recorded followed by up to 2048 samples over the entire averaged waveform (28 seconds, recording cycle). If external synchronization is used, a single cycle of the reference wave-form is recorded following the averaged waveform (60 seconds recording cycle).

The DataLogger provides read-after-write verification of data. All records are written in ASCll code.

If the cassette DataLogger is not acquired initially with the M-4 Receiver it can be retrofitted at any later time by the user.

CONSOLE

Keypad	Digits, decimals and sign arranged in calculator format. The following quantities may be displayed via keypad entry:

Time Domain Mode

Primary Voltage	UP
Self Potential	SP
Chargeability	Ch 0 to Ch 9 Ten windows of equal width Ch Sum of all ten windows (see Figure 1.5)
Phases of Odd Harmonics	P3 to P15
Cycle Count	nC
Repeat	RPT initiates automatic sequential display of primary voltage UP and total chargeability

Frequency Domain Mode

Primary Amplitude	A 1
Percent Frequency Effect	PFE
Self Potential	SP
Cycle Count	nC

Complex Resistivity

Phases of Odd Harmonics	P3 to P15
Amplitudes of Odd Harmonics	A 1 to A 15
With Reference Input	Fundamental phase P 1
Cycle Count	nC

Operation

Battery Voltage	bA
Frequency Error	FA

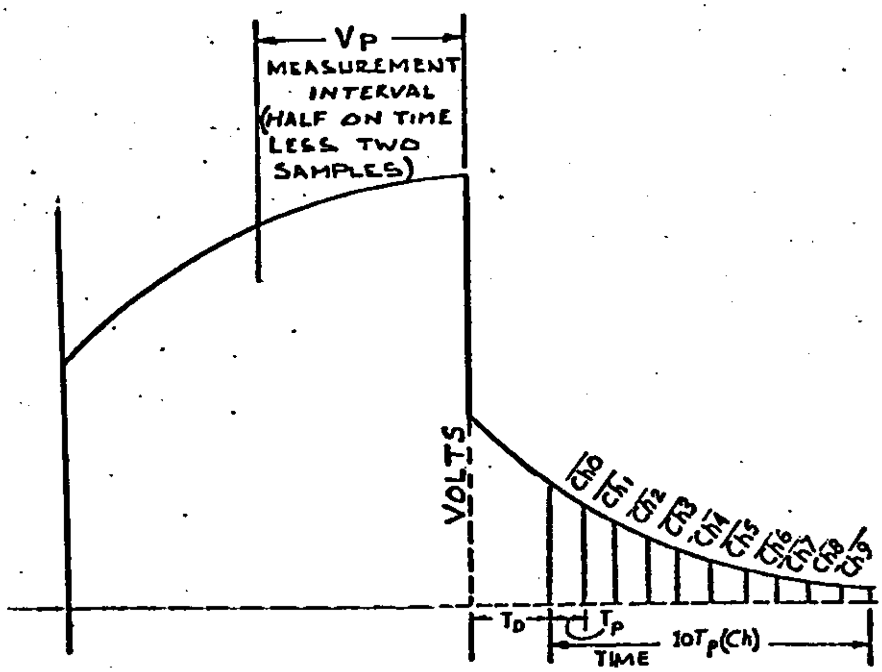


Fig. 1.5 TIME DOMAIN WAVEFORM

Cassette Datalogging

10 Reference Registers	rE 0 to rE 9 for coded operating data such as station number, line number, time, date, operator weather, transmitter current, etc.
Storage	STO. instructs the storage of keyed data to storage register.

SWITCHES

Designation	Type	Function
Start/Stop	2 position spring loaded toggle	Main power switch
Run/Standby	2 position toggle	RUN: instructs receiver to execute measurement routine STANDBY: stops measurement cycle, retains data for display or logging
HI/LO	2 position toggle	HI: high frequency measurement LO: low frequency measurement
Record/Abort	2 position spring loaded toggle	RECORD: logs data ABORT: arrests data logging
X1/OFF/X10 Resistance	3 position rotary	Source resistance measurement scale factor

PROGRAMMING SUB-PANEL CONTROLS

Designation	Position	Function
SYNC	INT.	Select when no external reference is available
	EXT.	Select with external reference
FREQ.	STD.	Informs receiver that standard frequencies are used
	CUST.	Instructs receiver to interpret frequency thumbwheel setting as a code for customer defined frequencies
	TIME	For time domain mode
	FREQ.	For frequency domain or complex resistivity modes

PROGRAMMING SUB-PANEL CONTROLS (cont'd)

Cassette	Part Full	See cassette description
LOG.Freq.	+ or -	Informs receiver of sign of LOG F thumbwheel setting
	PFE	Select for frequency domain operation employing dual transmitted frequencies
	Z	Select for complex resistivity
NOTCH FILTER	OUT	Select for no line rejection filter
	IN	Select for line rejection filter
	50 Hz	Select for line rejection at 50 Hz
	60 Hz	Select for line rejection at 60 Hz
LP.FILTER	OUT	Full 100 Hz bandwidth at input stage
	IN	At input frequencies 0.25to 1Hz restricts bandwidth to 12 Hz for rapid convergence

THUMBWHEEL SWITCHES

Designation	Number	Function
Delay	3 digits	Sets delay (T_D) in milliseconds for time domain measurements (see Fig 1.3)
Int.Time	3 digits	Sets chargeability window width (T_p) in milliseconds (see Fig. 1.3)
LOG.F	1 digit	Represents $\log_2$ of programmed frequencies, 1/64 Hz to 16 Hz or Code representing customer defined frequencies*
F1/F2	1 digit	Represents ratio of 1 to 10 (0 digit represents 10) of the high frequency to the LOG F setting in PFE mode

* In complex resistivity mode maximum input frequency is determined by highest odd harmonics desired:

Frequency, Hz	Maximum Odd Harmonic
1/64 to 4 Hz	15(15/64 to 60 Hz)
8 Hz	11(88 Hz)
16 Hz	5(80 Hz)

If not specified the default customer defined frequencies and associated LOG F thumbwheel settings are:

LOG F	FREQUENCY
0	0.078125
1	0.15625
2	0.3125
3	0.625
4	1.25
5	2.5
6	5.0
7	10.0

PHEONIX GEOPHYSICS LIMITED

IPT-1 INDUCED POLARIZATION TRANSMITTER

Specifications

Power Sources - Internal DC power module containing 8 45V dry cell batteries, or internal AC power module with external 1KVA, 2KVA or 3KVA motor generator.

Ammeter Ranges - 30mA, 100mA, 300mA, 1A, 3A and 10A full scale.

Meter Display - A meter function switch selects the disply of current level, regulation status, input frequency, output voltage, control battery voltage or line voltage.

Current Regulation - The change in output current is less than 0.2% for a 10% change in input voltage or electrode impedance.

Output Waveform - Either DC, single frequency, two frequencies simultaneously, or time domain (50% duty cycle). Frequencies of 0.078, 0.156, 0.313, 1.25, 2.5, and 5.0 Hz are standard, whereas 0.062, 0.125, 0.25, 1.0, 2.0 and 4.0 Hz are optionally available. The simultaneous transmission mode has 0.313 and 5.0 Hz as standard, whereas 0.156 and 2.5 Hz are optional.

Frequency Stability - $\pm$ 1% from -40° to +60°C is standard. A precision time base in optionally available for coherent detection and phas IP measurements.

Protection - Current is turned off automatically if it exceeds 150% full scale or is less than 5% full scale.

Case - Non-conductive, high impact resistant plastic.

Dimensions - 20 x 40 x 55cm (9 x 16 x 22 inches).

Weight - 15 kg (31 lb) with DC power module.
16 kg (35 lb) with AC power module.

Standard Accessories - Pack frame, manual. At least one of the two possible power modules is required. The AC power module in turn requires one of the external 1KVA, 2KVA or 3KVA motor generatores and a connecting cable.

DC POWER MODULE (BPS-1)

Output Voltage - 8 x 45V dry cell batteries (Eveready 482, Mallory 202 or equivalent) are switched in series or parallel to provide output voltages of 90V, 180V and 360V.

Output Power - Recommended maximum output power is 30 watts. Absolute maximum output power is 100 watts.

Battery Life - Normal field operation, with low output power results in an average battery life expectancy of one month. Operation with the absolute maximum output power results in much shorter battery life.

Control Supply - 4 x 6V lantern batteries (Eveready 409, Mallory 908 or equivalent) connected in series/parallel are used to provide the 40 to 70 mA required for the control circuitry. Average battery life expectancy is six months.

Operating Temperature - 0°C to +60°C.

AC POWER MODULE (AC-3)

Output Voltage - 0V, 75V, 150V, 300V, 600V and 1200V.

Output Power - Maximum continuous output power is 3 kw. This requires the 3KVA motor generator.

Input Power - 350 to 1000 Hz, 60V (45V to 78V) 3 phase is standard. 120V (90V to 156V) and/or single phase may be link selected inside the module.

Current Regulation - Achieved by feedback to the alternator of the motor generator unit.

Operating Temperature - -40°C to +60°C.

Thermal Protection - Thermostat turns off at 65°C and turns back on at 55°C internal temperature.

STATEMENT OF QUALIFICATIONS

OF JAMES WRIGHT

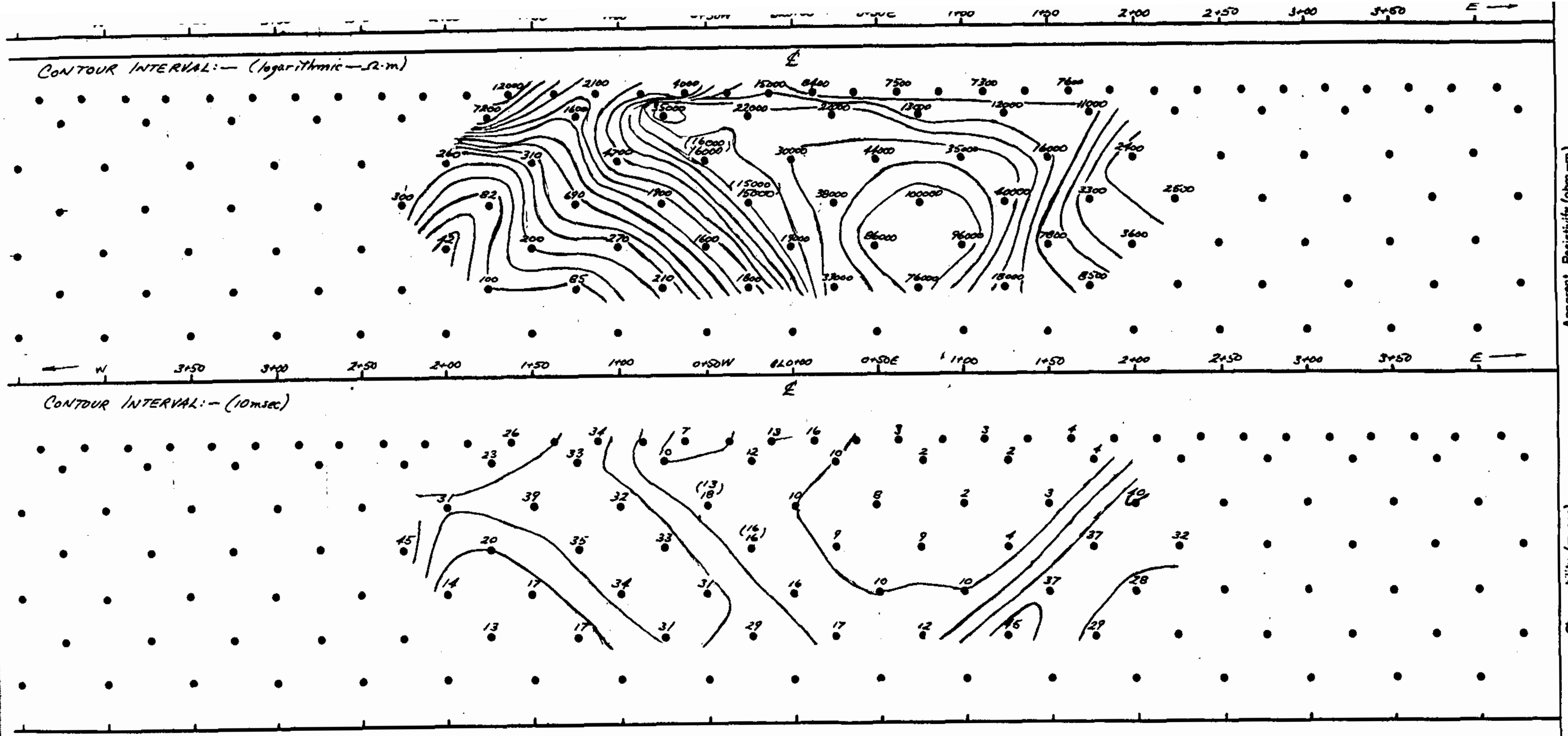
1969-1973	University of Arizona - B.Sc. Honours Geophysics
1973-1975	Stanford University - M.Sc.
1975-Present	Geophysicist with the St.Joe Minerals Group of companies - worked in U.S.A., Canada and South America as mining geophysicist.

Professional Affiliations:

Society of Exploration Geophysicists (SEG)

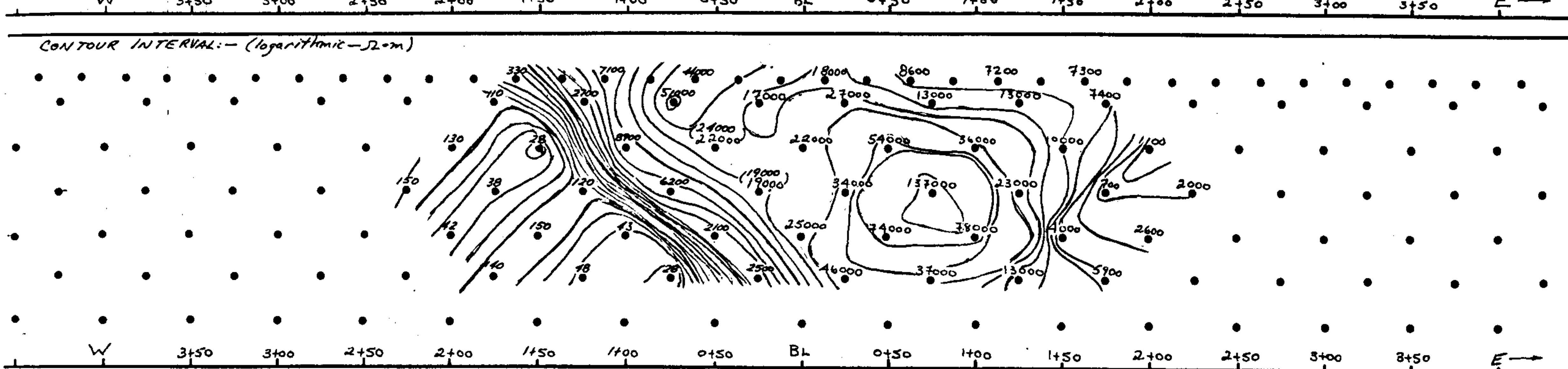
American Geophysical Union (AGU)

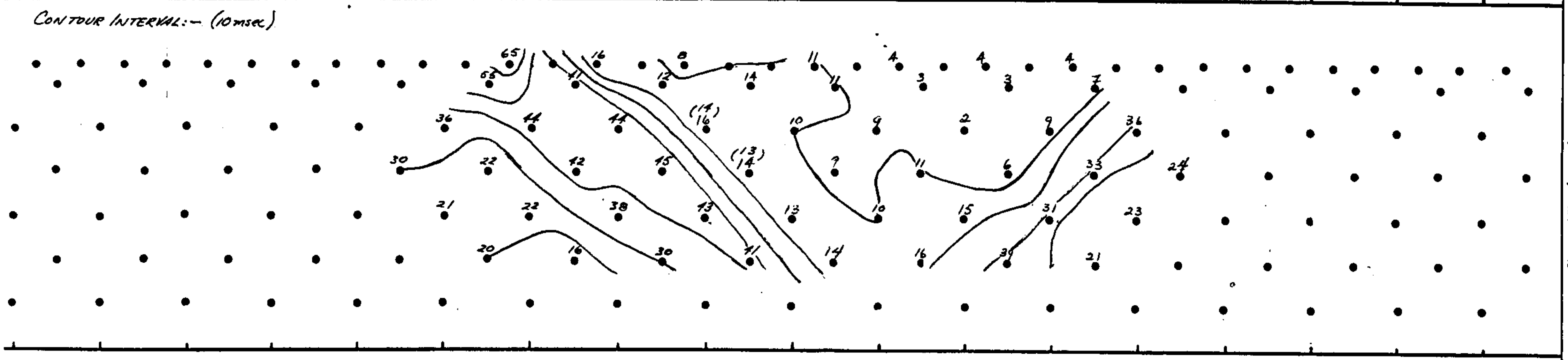
Canadian Exploration Geophysical Society (KEGS)



DATE JULY 31, 1980
LINE 1+50N
SPREAD 7
BEARING E-W

ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA
PROJECT 6201
AREA JUG CLAIMS, YUKON TERRITORY





ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA

PROJECT 6201

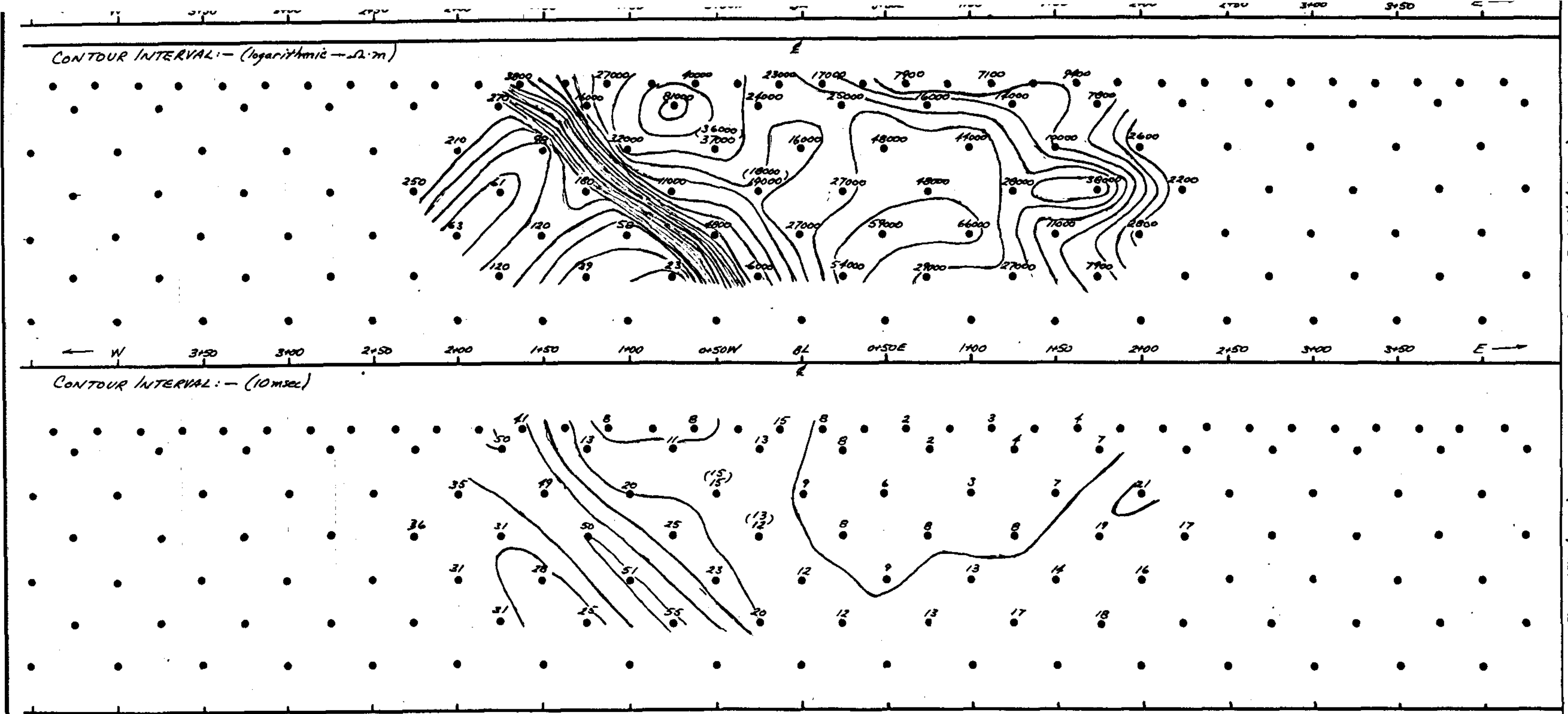
AREA JUG CLAIMS, YUKON TERRITORY

DATE JULY 31, AUGUST 1, 1980

LINE 1+00N

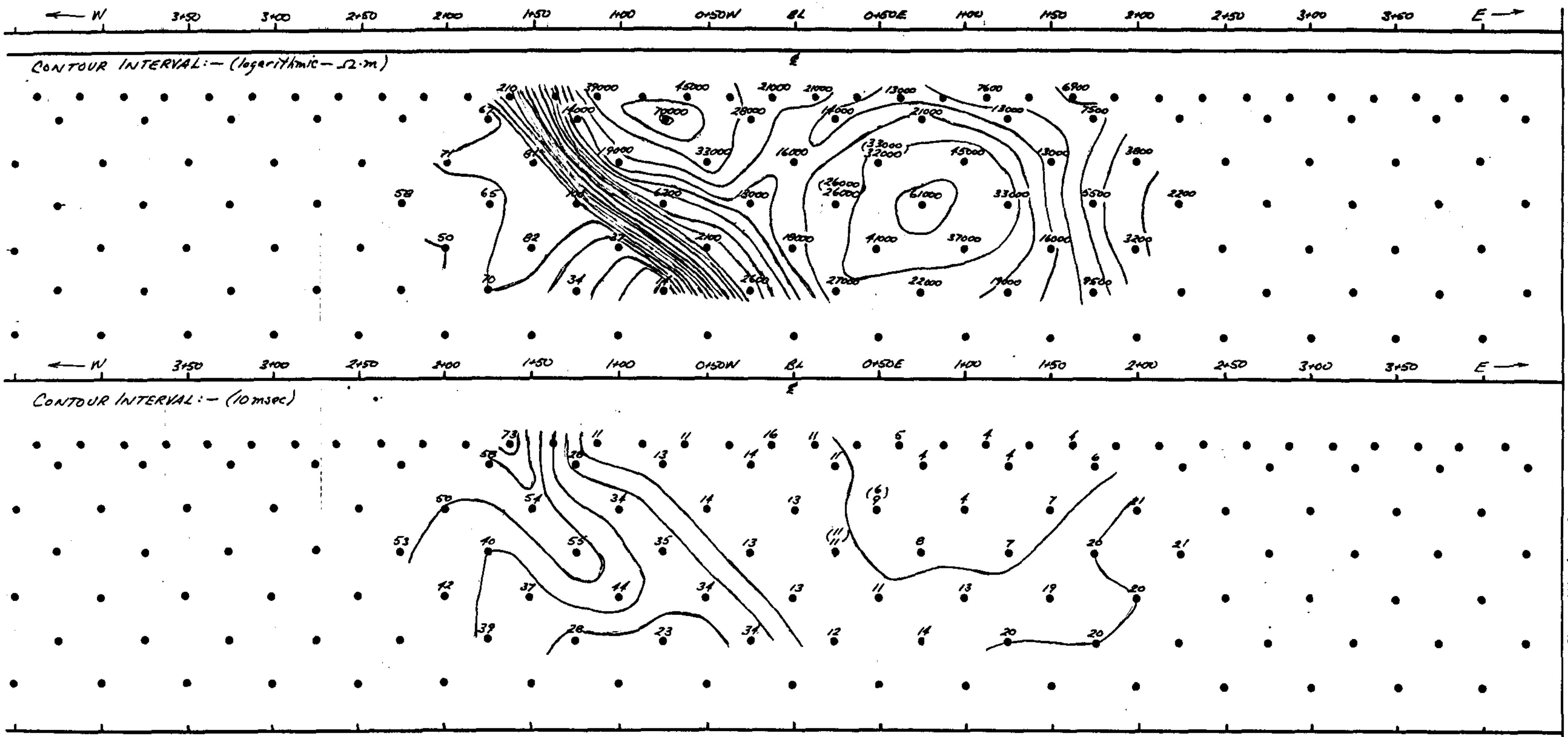
SPREAD 7

BEARING E-W



ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA
PROJECT 6201
AREA JUG CLAIMS, YUKON TERRITORY

DATE AUGUST 2, 1980
LINE 0+50N
SPREAD 7
BEARING E-



DATE August 2, 1980

LINE 0+00

SPREAD 7

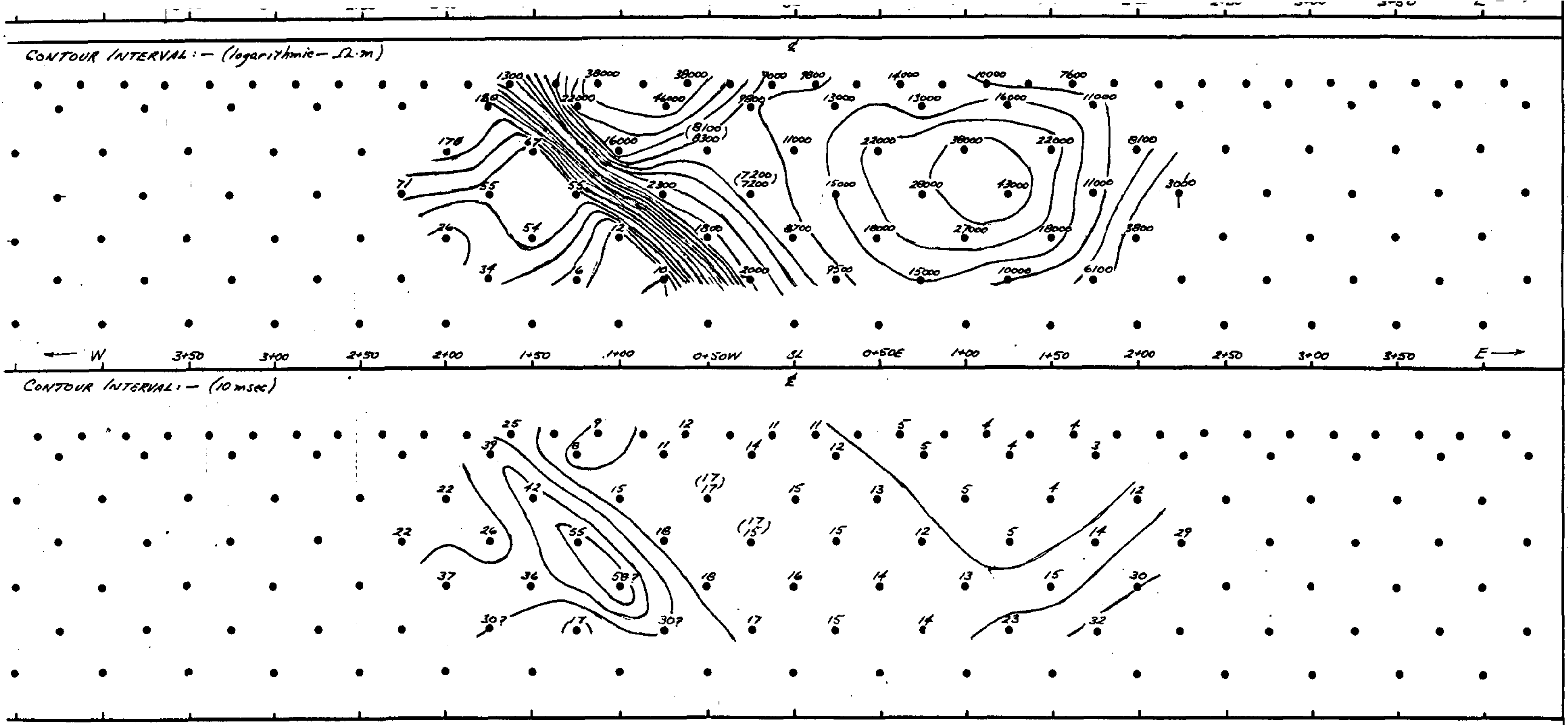
BEARING E-W

JOSEPH EXPLORATIONS LIMITED

ONTO, CANADA

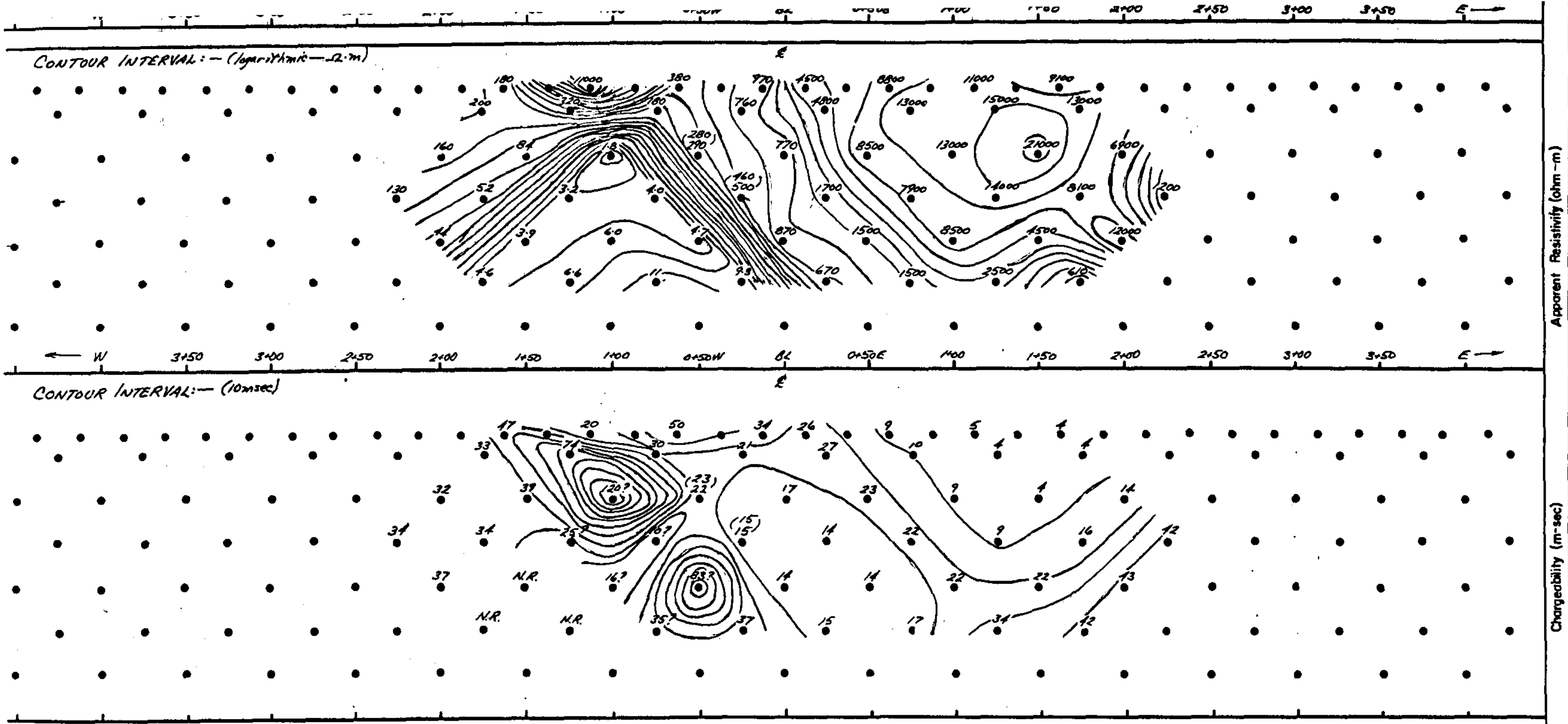
OJECT 6201

EA JUG CLAIMS, YUKON TERRITORY



DATE AUGUST 3, 1980
LINE 0+50S
SPREAD 7
BEARING E-

ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA
PROJECT 6201
AREA JUG CLAIMS, YUKON TERRITORY



ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA

PROJECT 6201

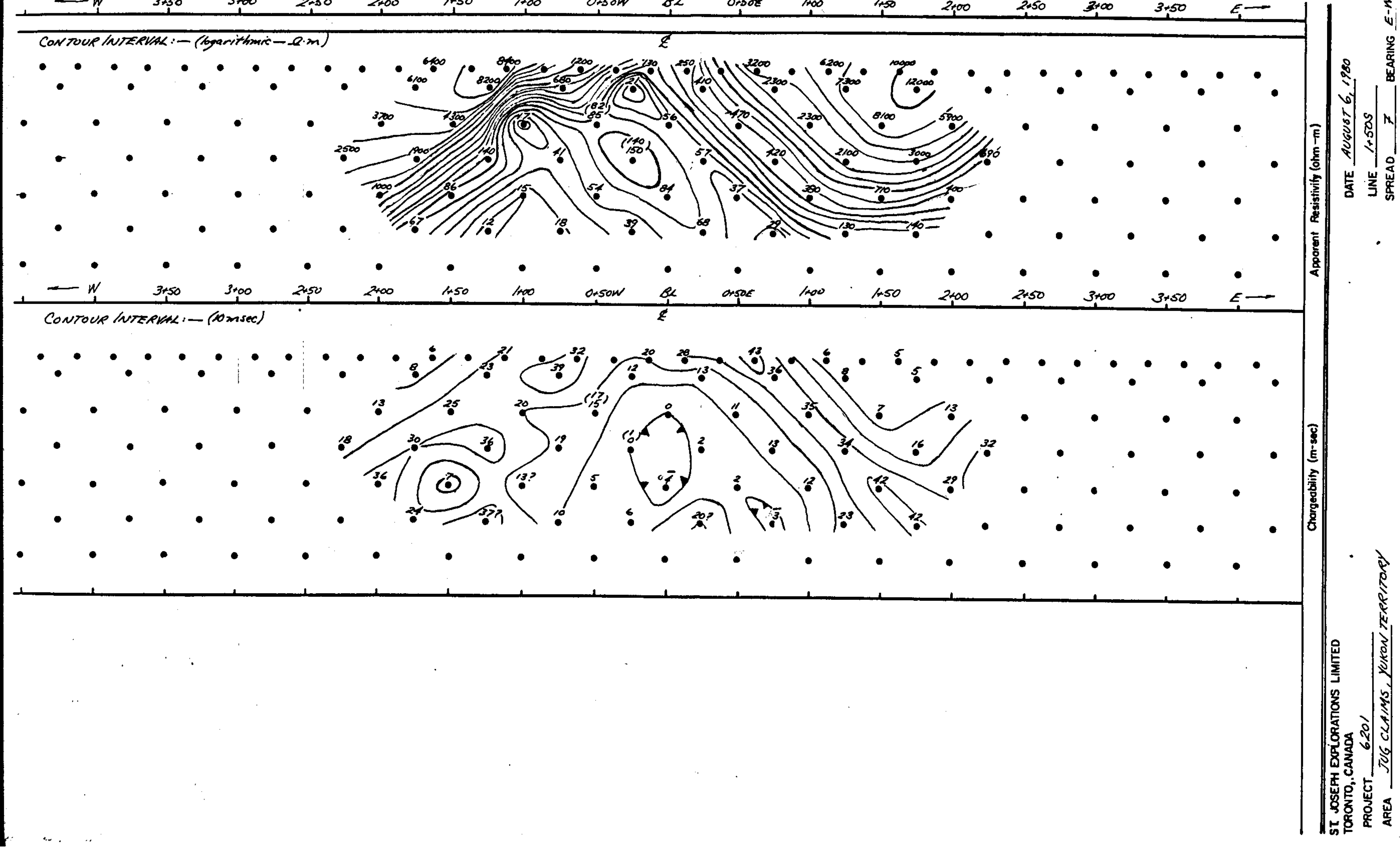
AREA JUG CLAIMS, YUKON TERRITORY

DATE August 1, 1980

LINE 1+00S

SPREAD 7

BEARING E-W


CONTOUR INTERVAL:— (logarithmic — Ω·m)
W 3+50 3+00 2+50 2+00 1+50 1+00 0+50W BL 0+50E 1+00 1+50 2+00 2+50 3+00 3+50 E
CONTOUR INTERVAL:— (10 msec)
Apparent Resistivity (ohm-m)
Chargeability (m-sec)
DATE AUGUST 6, 1980
LINE 1+50S
SPREAD 7
BEARING E-W
ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA
PROJECT 6201
AREA JUG CLAIMS, YUKON TERRITORY

Station	1+50S.	1+00S.	0+50S.	0+00	0+50N.	1+00N.	1+50N.
2+00W.	421	429	409	399	419	413	422
	423	425	405	409	420	412	399
	436	425	418	410	407	410	388
	432	419	415	416	401	404	380
1+50W.	425	416	416	417	396	411	395
	411	415	419	412	405	417	403
	407	419	418	410	405	439	413
	413	425	420	418	406	436	424
1+00W.	416	422	422	423	398	413	422
	430	412	415	430	408	413	421
	433	403	419	429	409	393	418
	427	416	421	435	423	388	399
0+50W.	427	411	411	425	415	391	395
	400	404	413	422	428	380	400
	431	409	412	421	382	407	405
	417	412	417	418	393	410	399
B.L. 0+00 Az. 340°	421	415	412	426	401	409	387
	411	412	413	417	388	423	398
	415	418	412	414	408	402	402
	414	414	409	417	403	398	414
0+50E.	418	420	417	413	402	404	405
	412	431	413	412	401	399	409
	411	431	410	416	412	398	413
	411	431	414	418	407	411	408
1+00E.	410	427	421	418	411	396	417
	412	424	417	415	410	404	409
	408	427	419	416	407	407	410
	413	423	418	418	408	412	414
1+50E.	417	426	414	420	410	406	408
	417	421	414	415	409	405	413
	423	419	410	406	409	401	413
	421	417	416	410	407	401	410
2+00E.	424	427	411	408	404	404	410

ENT 11
ENT 12
ENT 13
ENT 14
Stream

LEGEND

INSTRUMENTATION: Barringer GM-122 Proton Magnetometer.
Scintrex MBS-2, Base Station

BASE VALUE: 58400γ

DATUM SUBTRACTED: 58000γ

STATION INTERVAL: 12·5m.

CONTOUR INTERVAL: No Contours

LINE INTERVAL: 50 m.

PERSONNEL: G. Moum

DATE: July 27, 1980

ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA

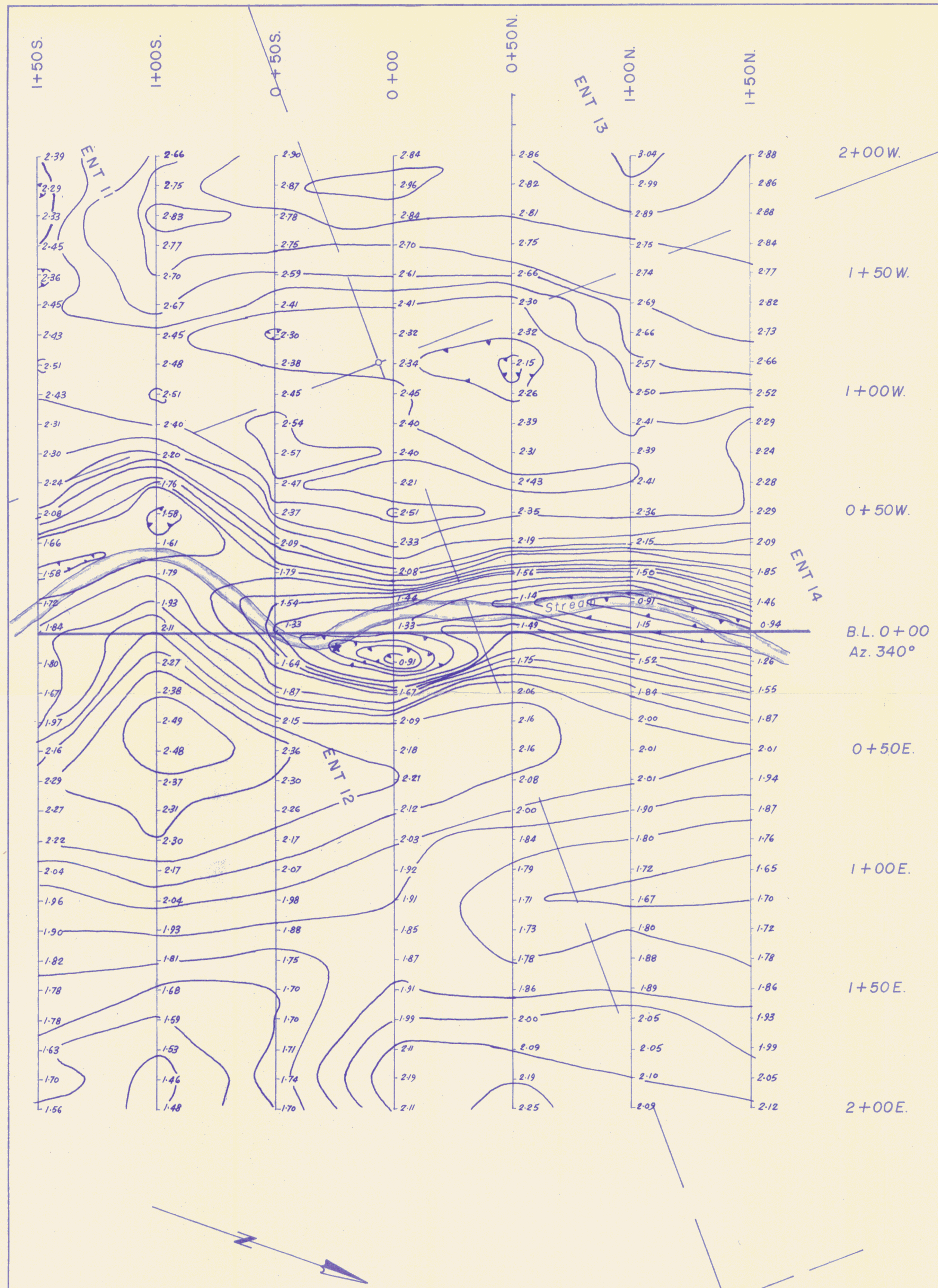
James J. Wright

JUG JOINT VENTURE, Yukon Terr.

MAGNETOMETER SURVEY

SCALE 1:1250

APPROX. LAT. & LONG. OF LOWER RT. COR. OF DWG.	PROJECT NO. 6201	SHEET NO. ___ OF ___
___° ___' ___" LATITUDE ___° ___' ___" LONGITUDE	REPORT NO. ___	N.T.S. 116 G/7



INSTRUMENTATION: Gravitymeter - Sodin G-410
Level - Sokkisha

STATION INTERVAL: 12.5m

CONTOUR INTERVAL: 0.1mgals = 1g.u.

LINE SPACING: 50m.

MAIN BASE STATION LOCATION: L0+25 S, 0+07E. ★

OPERATORS: J.Wright, D.Windsor, G.Moum, L. Stoliker

DATES: July 26 – Aug. 7, 1980

ST. JOSEPH EXPLORATIONS LIMITED

TORONTO, CANADA

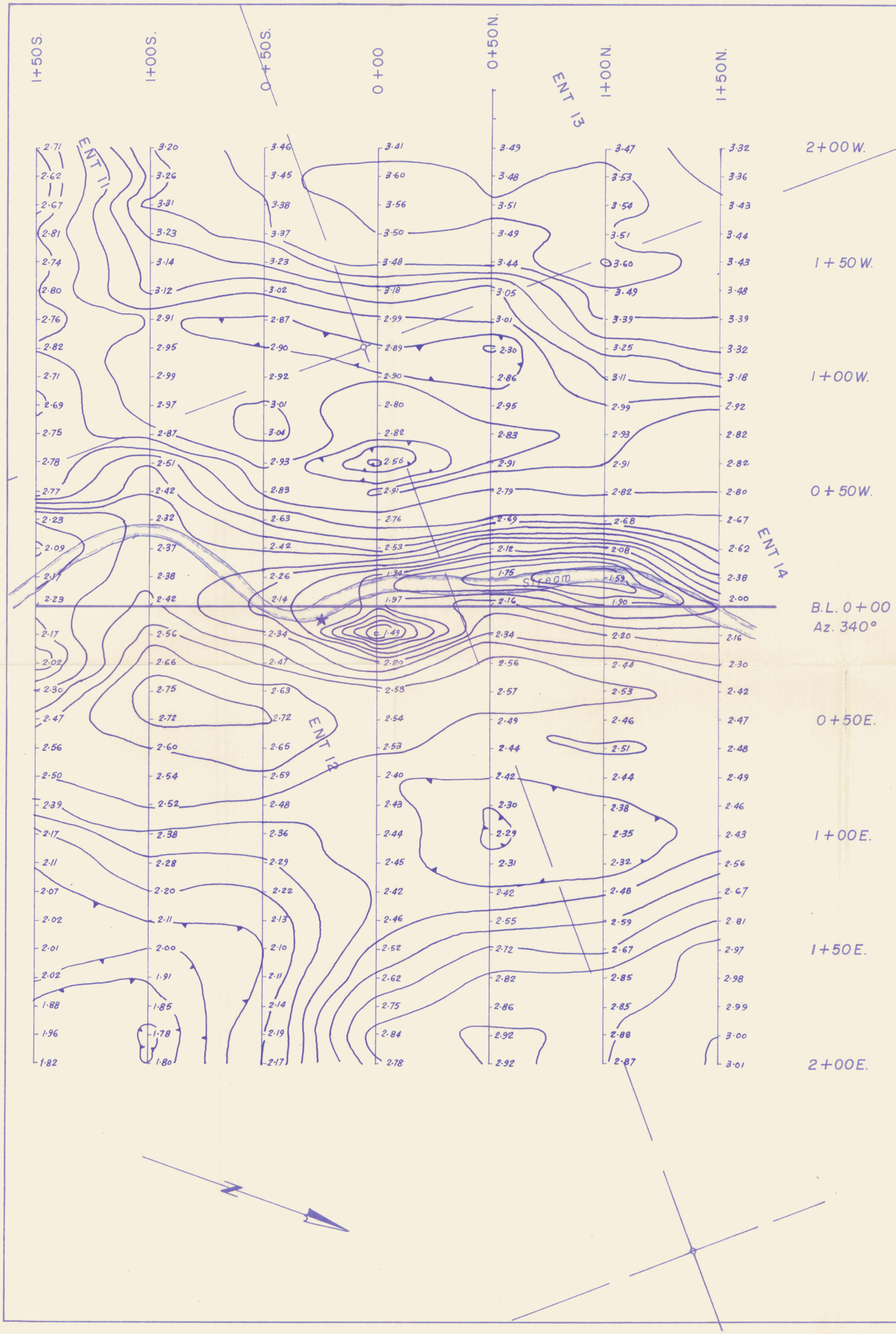
James 2. Wright

JUG JOINT VENTURE, Yukon Terr.

BOUGUER ANOMALY GRAVITY SURVEY

SCALE 1:1250

APPROX. LAT. & LONG. OF LOWER RT. COR. OF DWG. ___°___'___" LATITUDE ___°___'___" LONGITUDE	PROJECT NO. 6201	SHEET NO. ___ OF ___
	REPORT NO. ___	N.T.S. 116 G/7



INSTRUMENTATION: Gravitymeter - Sodin G-410
Level - Sokkisha

STATION INTERVAL: 12.5m

CONTOUR INTERVAL: 0.1 mgals = 1g.u.

LINE SPACING: 50m.

MAIN BASE STATION LOCATION: L 0+25 S, 0+07E. ★

OPERATORS: J. Wright, D. Windsor
G. Moum, L. Stoliker

DATES: July 26 - Aug 7, 1980

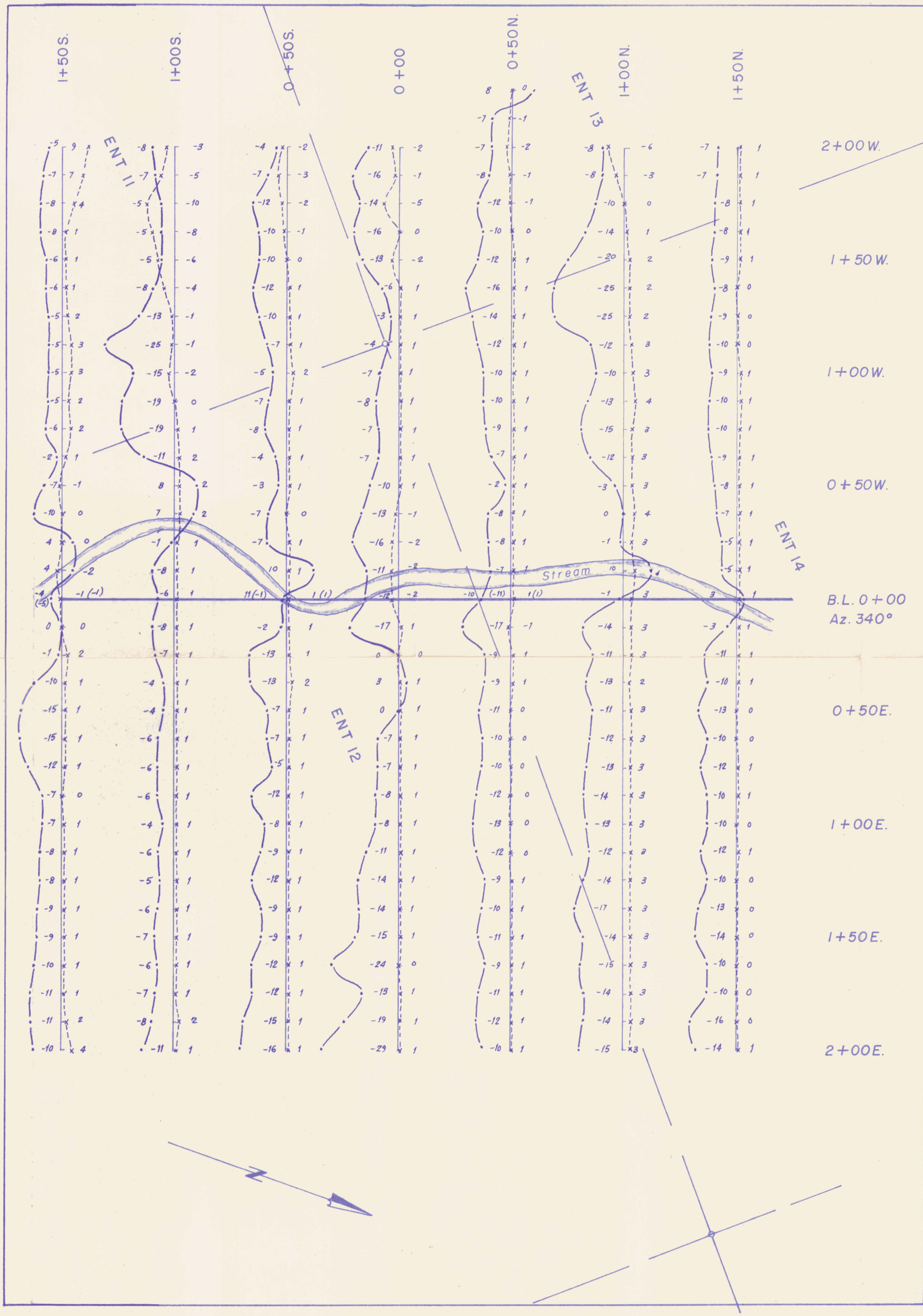
ST. JOSEPH EXPLORATIONS LIMITED
TORONTO, CANADA

James J. Wright

JUG JOINT VENTURE, Yukon Terr.
GRAVITY SURVEY
COMPLETE BOUGUER ANOMALY

SCALE 1:1250

APPROX. LAT. & LONG. OF LOWER RT. COR. OF DWG. ___° ___' ___" LATITUDE ___° ___' ___" LONGITUDE	PROJECT NO. 6201	SHEET NO. ___ OF ___
	REPORT NO. ___	N.T.S. 116 G/7



LEGEND

I.P. (−)	O.P. (+)
-5	10
-10	5
-15	0
-20	-5
-15	0

Profile Scale 1cm = 10%

Instrument: Apex Parametrics Max-Min II

Cable length: 50m.

Station Interval: 12·5 m

Line Spacing: 50m.

In Phase: I.P ·—·—·—

Out of phase: O.P x-- x --x--x

Operators: L. Stoliker, G. Moum

Date: July 27, 28, 1980

ST. JOSEPH EXPLORATIONS LIMITED

TORONTO, CANADA

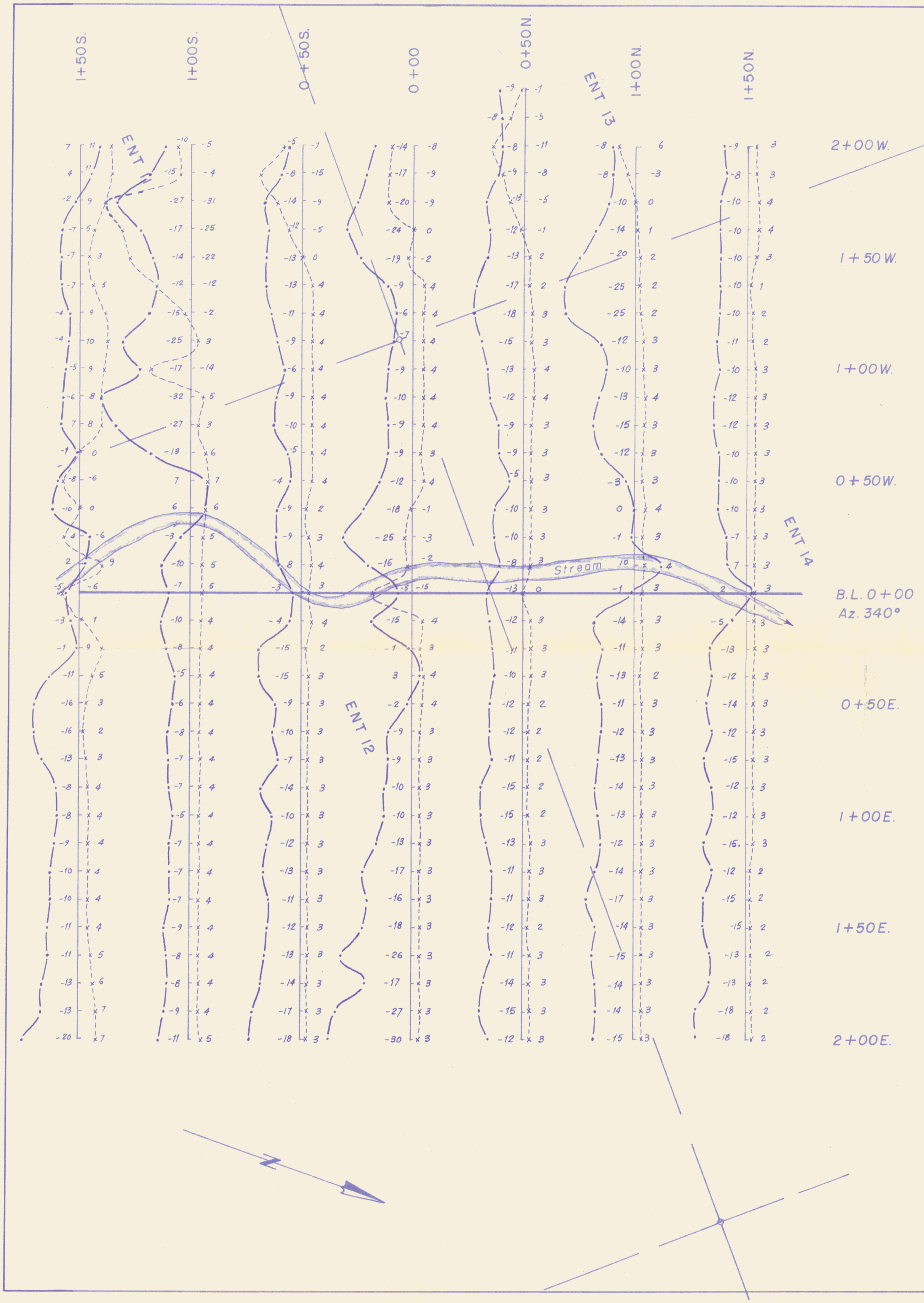
James L. Wright

JUG JOINT VENTURE, Yukon Terr.

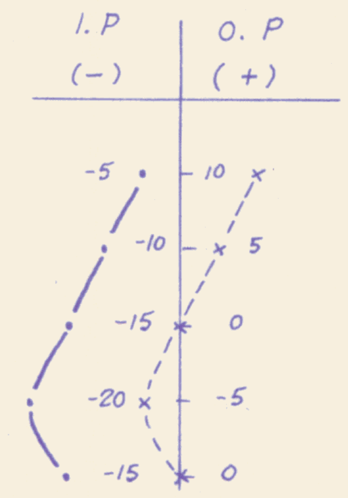
H. L. E. M. SURVEY, 888 Hz

SCALE 1:1250

APPROX. LAT. & LONG. OF LOWER RT. COR. OF DWG.	PROJECT NO. 6201	SHEET NO. ___ OF ___
° ' " LATITUDE ° ' " LONGITUDE	REPORT NO.	N.T.S. 116 G/7



LEGEND



Profile Scale 1cm = 10%

Instrument: Apex Parametrics Max-Min II

Cable length: 50m.

Station Interval: 12·5m.

Line Spacing: 50m.

In Phase: I.P —·—·—·

Out of phase: O.P x-- x--x--x

Operators: L. Stoliker, G. Moum

Date: July 27, 28 1980

ST. JOSEPH EXPLORATIONS LIMITED

TORONTO, CANADA

James ... Wright

JUG JOINT VENTURE, Yukon Terr.

H.L.E.M. SURVEY, 3555 Hz.

SCALE 1:1250

APPROX. LAT. & LONG. OF LOWER RT. COR. OF DWG. ° ' " LATITUDE ° ' " LONGITUDE	PROJECT NO. 6201	SHEET NO. ___ OF ___
	REPORT NO. ___	N.T.S. 116 G/7